FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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USE OF MEAT AND BONE MEAL IN PRACTICAL CATFISH FEEDS - POND STUDY

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SUMMARY

A POND FEEDING STUDY WAS INITIATED IN MAY AND TERMINATED IN OCTOBER, 1989, IN WHICH CHANNEL CATFISH WERE FED A BASAL SOYBEAN MEAL-CORN DIET AND THE BASAL DIET SUPPLEMENTED WITH EITHER FISH MEAL OR MEAT-AND-BONE MEAL, OR A FISH MEAL-MEAT AND BONE MEAL COMBINATION. THIS REPRESENTS FOUR TREATMENTS, EACH REPLICATED IN THREE PONDS. THE FISH WERE EVALUATED FOR WEIGHT GAIN, FEED CONVERSTION AND DRESSING PERCENTAGE.

UNDER THIS EXPERIMENTAL CONDITIONS, THERE WAS NO DIFFERENCE ($P<0.05$) IN HARVEST WEIGHT AMONG FISH FED THE VARIOUS SUPPLEMENTAL ANIMAL PROTEINS. ADDITION OF ALL ANIMAL PROTEIN SOURCES TO THE SOYBEAN MEAL-CORN DIET SIGNIFICANTLY IMPROVED WEIGHT GAIN. FEED CONVERSION WAS RELATIVELY SIMILAR FOR ALL TREATMENTS, SUGGESTING THAT IMPROVED PALATABILITY RATHER THAN IMPROVED NUTRITIONAL VALUE MAY HAVE BEEN RESPONSIBLE FOR THE IMPROVED WEIGHT GAIN CREDITED TO ADDING THE ANIMAL PROTEIN TO THE SOYBEAN MEAL-CORN DIET.

JUSTIFICATION

Results of 1987 research supported by the Fats and Proteins Research Foundation showed that meat and bone meal (MBM) is significantly improved weight gains when incorporated into a soybean meal-corn basal diet; 10% MBM in the diet improved growth more than 5% MBM. However, MBM was not as beneficial as fish meal (FM) in the basal all-plant diet. Laboratory studies are more sensitive than pond grow-out studies. Results are often different between the two in that differences found in the lab studies may not occur when the fish are fed to a larger size in ponds. We initiated a study to evaluate similar feeds as were compared in the lab study but the feeds were fed to catfish in ponds for an entire growing season.

OBJECTIVES

1. Evaluate supplementation of a soybean meal-corn diet with meat and bone meal, fish meal, and a combination of meat and bone meal plus fish meal.

METHODS

The basal soybean meal-corn diet (control) and diets containing 10% MBM, 10% FM, and 5% MBM plus 5% FM are shown in Table 1. The diets were processed into floating catfish feeds at a commercial extrusion plant. Fish were stocked at commercial rates (4500/acre) in 0.1-acre earthen ponds (3 ponds per treatment) and fed the test diets for a 5-6 month growing season which will end near October, 1989. Weight gain, fed conversion and dressing percentage were measured at harvest.

RESULTS

There was no significant difference ($P>0.05$) in mean harvest weight among the treatments receiving animal protein. Addition of animal protein to the soybean meal-grain formula significantly ($P<0.05$) increased weight gains.

Feed conversion was not significantly ($P>0.05$) different among treatments although the all-plant diet was slightly higher. This lack of significant

DIFFERENCE IN FEED CONVERSION INDICATES THAT FEED CONSUMPTION WAS NEARLY IN PROPORTION TO WEIGHT GAIN, AND THIS SUGGESTS THAT A REASON FOR LESS WEIGHT GAIN BY FISH FED THE BASAL DIET WAS REDUCED FEED CONSUMPTION. PREVIOUS LABORATORY STUDIES HERE (MOHSEN AND LOVELL 1990) INDICATED THAT INITIAL FOOD CONSUMPTION BY CHANNEL CATFISH WAS HIGHER WHEN ANIMAL PROTEIN WAS ADDED TO A SOYBEAN MEAL-CORN BASAL FORMULA.

ALL DIETS MET THE ESSENTIAL AMINO ACID REQUIREMENTS FOR CHANNEL CATFISH (NRC 1985), HOWEVER, THE FISH MEAL DIET WAS SLIGHTLY HIGHER IN LYSINE AND METHIONINE. THE DIET CONTAINING MEAT AND BONE MEAL ACTUALLY WAS LOWER IN THESE CRITICAL AMINO ACIDS THAN THE BASAL DIET. REASON FOR THE IMPROVEMENT IN WEIGHT GAIN UPON ADDITION OF ANIMAL PROTEIN TO THE ALL-PLANT BASAL DOES NOT SEEM TO BE CAUSED BY IMPROVEMENT IN AMINO ACID PROFILE OF THE DIET FOR CHANNEL CATFISH.

DRESSING PERCENTAGE WAS NOT SIGNIFICANTLY ($P>0.05$) AFFECTED BY DIETARY TREATMENT. PREVIOUS RESEARCH SHOWED THAT FEEDING LOW QUALITY PROTEIN (PRIMARILY PEANUT MEAL) TO CHANNEL CATFISH IN PONDS NOT ONLY REDUCED WEIGHT GAIN BUT ALSO REDUCED DRESSING PERCENTAGE, PROBABLY BECAUSE OF HIGHER AMOUNT IN THE FISH FED THE INFERIOR PROTEIN.

OUR FATTY ACID ANALYSIS EQUIPMENT IS NOT OPERATING SATISFACTORILY AT PRESENT. WE ARE TOILING WITH THIS PROBLEM AND WILL PROVIDE FATTY ACID ANALYSES AT A LATER TIME.

THESE RESULTS INDICATE THAT UNDER THESE EXPERIMENTAL CONDITIONS, SUPPLEMENTING A SOYBEAN MEAL-CORN FORMULA WITH GOOD QUALITY MEAT AND BONE MEAL WAS PRACTICALLY AS BENEFICIAL AS SUPPLEMENTING WITH FISH MEAL. HOWEVER, SEVERAL FACTORS CAN CAUSE THE RESPONSE OF CHANNEL CATFISH TO SUCH DIETS TO BE DIFFERENT FROM THAT FOUND HERE. FEEDING RATE CAN INTERACT WITH PROTEIN QUALITY. UNDER RESTRICTED FEEDING, WHICH MANY FARMERS PRACTICE TO MINIMIZE FEED WASTE, FISH ARE MORE SENSITIVE TO DIETARY PROTEIN QUALITY THAN UNDER LIBERAL OR SATIATION FEEDING. THE FISH IN THIS STUDY WERE FED LIBERALLY. WHEN OTHER INGREDIENTS ARE USED IN THE FORMULA, SUCH AS COTTONSEED MEAL OR PEANUT MEAL, WHICH ARE OF MUCH LOWER PROTEIN QUALITY THAN SOYBEAN MEAL, THE MEAT AND BONE MEAL MAY NOT

SUBSTITUTE ON AN EQUAL PROTEIN BASIS FOR FISH MEAL. FISH SIZE IS A FACTOR. THESE FISH WERE GROWN TO HARVEST SIZE (APPROXIMATELY 1 LB). SMALL FINGERLINGS ARE MORE SENSITIVE TO PROTEIN QUALITY AND WOULD PROBABLY NOT HAVE GROWN AS WELL WHEN MEAT AND BONE MEAL SUBSTITUTED FOR FISH MEAL, AS DEMONSTRATED IN THE PREVIOUS STUDY SUPPORTED BY THE FATS AND PROTEINS FOUNDATION.

THUS, THIS STUDY SHOWS THAT MEAT AND BONE MEAL SIGNIFICANTLY IMPROVES A BASAL SOYBEAN MEAL-GRAIN DIET FOR GROW-OUT CATFISH. UNDER SOME, PERHAPS MANY, MANAGEMENT CONDITIONS MEAT AND BONE MEAL WILL COMPLETELY REPLACE FISH MEAL IN A SOYBEAN MEAL-GRAIN BASED CATFISH FEED.

REFERENCES

MOHSEN, W. AND R. T. LOVELL. 1990. PARTIAL SUBSTITUTION OF SOYBEAN MEAL WITH ANIMAL PROTEIN SOURCES IN DIETS FOR CHANNEL CATFISH. AQUACULTURE. ACCEPTED FOR PUBLICATION. OCTOBER, 1989.

NRC (NATIONAL RESEARCH COUNCIL). 1985. NUTRIENT REQUIREMENTS OF WARMWATER FISH. NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D.C.

Table 1. Ingredient compositon of experimental diets containing fish meal (FM), meat and bone meal (MBM), and a meat and bone meal-fish meal combination.

Item	Basal	10 FM	11.3 MBM	5 FM 5.6 MBM
	(%)	(%)	(%)	(%)
Ingredient:				
Soybean meal	62.6	48.4	47.0	48.4
Menhaden fish meal	0.0	10.0	0.0	0.0
Meat & bone meal	0.0	0.0	11.3	6.32
Corn meal	32.26	37.44	38.60	37.57
Vitamin mix[1]	1.4	1.4	1.4	1.4
Vitamin C	0.1	0.1	0.1	0.1
Trace mineral mix[2]	0.2	0.2	0.2	0.2
Dicalcium phosphate	2.04	1.06	0.0	0.93

Table 2. Means (± SD) for harvest weight, feed conversion, and dressing percentage for channel catfish fed diets containing fish meal (FM), meat and bone meal (MBM), and meat and bone meal-fish meal combination in earthen ponds[1].

Treatment	Harvest weight[2] (g)	Lb feed/lb weight gain	Dressing percentage
Basal	0.88[a] (0.07)	1.40[a]	57.5[a]
FM	1.04[b] (0.10)	1.31[a]	58.1[a]
MBM	1.00[b] (0.09)	1.36[a]	58.2[a]
FM-MBM	0.98[b] (0.08)	1.34[a]	58.5[a]

1 Means in the column followed by the same letter do not differ ($P > 0.05$).

2 Initial size was 35 lb/1000 fish, 5.1 inches lenght.